MONTHLY WEATHER REVIEW.

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INTRODUCTION.

The MONTHLY WEATHER REVIEW for June, 1905, is based on data from about 3486 stations, classified as follows:

Weather Bureau stations, regular, telegraph, and mail, 176; West Indian Service, cable and mail, 4; River and Flood Service, regular 52, special river and rainfall, 363, special rainfall only, 98; cooperative observers, domestic and foreign, 2565; total Weather Bureau Service, 3258; Canadian Meteorological Service, by telegraph and mail, 33; Meteorological Service of the Azores, by cable, 2; Meteorological Office, London, by cable, 8; Mexican Telegraph Company, by cable, 3; Army Post Hospital reports, 18; United States Life-Saving Service, 9; Jamaica Weather Service, 130; Costa Rican Meteorological Service, 25. Total, 3486.

Since December, 1904, the Weather Bureau has received an average of about 1700 reports from as many observers and vessels, giving international simultaneous observations over the Atlantic and Pacific oceans at 12 noon, Greenwich time, or 7 a. m., seventy-fifth meridian time. These are charted, and, with the corresponding land observations, will form the framework for daily weather charts of the globe.

Special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada; Señor Manuel E. Pastrana, Director of the Central Meteorological and Magnetic Observatory of Mexico; Camilo A. Gonzales, Director-General of Mexican Telegraphs; Capt. S.I. Kimball, General Superintendent of the United States Life-Saving Service; Commander H. M. Hodges, Hydrographer, United States Navy; H. Pittier, Director of the Physico-Geographic Institute, San José, Costa Rica; Commandant Francisco S. Chaves, Director of the Meteorological Service of the Azores, Ponta Delgada, St. Michaels, Azores; W. N. Shaw, Esq., Secretary, Meteorological Office, London; H. H. Cousins, Chemist, in charge of the Jamaica Weather Office; and Señor Enrique A. Del Monte, Director of the Meteorological Service of the Republic of Cuba.

Attention is called to the fact that at regular Weather Bureau stations all data intended for the Central Office at Washington are recorded on seventy-fifth meridian or eastern standard time, except that hourly records of wind velocity and direction, temperature, and sunshine are entered on the respective local standards of time. As far as practicable, only the seventy-fifth meridian standard of time, which is exactly five hours behind Greenwich time, is used in the text of the REVIEW. The standards used by the public in the United States and Canada and by the cooperative observers are believed to conform generally to the modern international system of standard meridians, one hour apart, beginning with Greenwich. The Hawaiian standard meridian is 157° 30′, or $10^h\ 30^m$ west of Greenwich. The Costa Rican standard meridian is that of San José, $5^h\ 36^m$ west of Greenwich.

Barometric pressures, whether "station pressures" or "sea-level pressures", are now reduced to standard gravity, so that they express pressure in a standard system of absolute measures.

In conformity with Instructions No. 43, March 29, 1905, the designation "voluntary", as applied to the class of observers performing services under the direction of the Weather Bureau without a stated compensation in money, is discontinued, and the designation "cooperative" will be used instead in all official publications and correspondence.

FORECASTS AND WARNINGS.

By Prof. E. B. GARRIOTT, in charge of Forecast Division.

Several barometric depressions of moderate intensity appeared over the eastern Atlantic, the most important of which moved slowly northward west of the British coasts during the second decade of the month with reported barometric readings of 29.44 inches at Valentia on the 17th, and 29.42 at Malin Head, Ireland, on the 20th. From the 5th to 7th and 24th to 27th disturbances advanced northward over western continental Europe with areas of high barometric pressure over the British Isles. During the 29th and 30th a disturbance moved from a position off the south coast of Ireland over northwestern France. In the vicinity of the Azores the barometer was uniformly high, except from the 14th to the 20th, when a disturbance, above referred to, occupied the ocean west of the British Isles. The disturbances that advanced over the Atlantic Ocean from the American coast were of moderate strength.

In the United States rains were frequent and heavy in the north and west-central portions of the country during the first and second decades of the month, the severest storms of this period occurred in lower Michigan and eastern New York under conditions that attended low area No. V. A detailed description of the tornadic storm that visited Binghamton, N. Y., the night of the 5th, appears elsewhere in this issue of the REVIEW. During the afternoon of the 30th, severe local storms occurred in the middle and upper Mississippi Valley, within the field occupied by low area No. XII.

The important floods of the month occurred in the upper Mississippi, Red, and Rio Grande rivers, all of which are discussed under the heading "Rivers and Floods." The flood stages in Arkansas and northwestern Louisiana were accurately forecast and special warnings were sent to inundated districts ten days in advance of the flood. The month opened with flood stages in the Rio Grande River, in New Mexico, and the fluctuations in that river were accurately forecast.

BOSTON FORECAST DISTRICT.

The weather was much cooler than the average for the month and the monthly mean temperatures were below the normal at nearly all stations. The minimum temperatures occurred during the first decade, and light to killing frosts were reported, mostly on the 2d and the 9th, in parts of all the New England States, except Rhode Island. Little if any damage resulted from the frosts. The precipitation was decidedly in excess of the average and positive departures were noted at nearly all stations. The month was devoid of stormwinds or gales and there was no delay to shipping, except from fog, which was somewhat more prevalent than usual for this month. No storm warnings were issued during June, 1905.—*J. W. Smith, District Forecaster.*

NEW ORLEANS FORECAST DISTRICT.

No well-marked disturbance crossed the district during the month, and no special warnings were issued. Scattered thunderstorms, which were generally covered in the forecasts, occurred on several dates. There were frequent rains, especially during the last decade.—*I. M. Cline, District Forecaster.*

CHICAGO FORECAST DISTRICT.

No storm warnings were ordered and no general storms for which warnings should have been ordered occurred on the upper Lakes.

A forecast of light frost in the cranberry district was issued on the 21st, and, according to reports, the forecast was verified. It is believed, however, that no damage was done to the cranberry crop.—*H. J. Cox, Professor and District Forecaster.*

LOUISVILLE FORECAST DISTRICT.

No unusual storms passed over the district during the month, though during the middle and latter half there were frequent thunderstorms and heavy rainfalls. After the 18th, there was not a day on which more or less heavy and general showers did not occur over the district. The first ten days, however, were mostly fair and warm. The thermal condition of the month was about normal, with no marked departures.—*Ferdinand J. Walz, District Forecaster.*

DENVER FORECAST DISTRICT.

No unusual weather conditions prevailed.

As a result of the melting of snow in the higher mountains of Colorado, streams on all slopes of the Continental Divide were badly swollen during the first half of the month. Considerable damage resulted in the vicinity of Florence, on the Arkansas, and also in the southwestern part of Colorado.

In the Rio Grande, at El Paso, the highest stage was reached the morning of the 1st, after which there was a gradual decline until the 8th, when, as a result of heavy rains, there was a material rise in the river for 200 miles north of El Paso. After the 17th, the river, in its lower reaches, fell steadily.

These different stages were accurately forecast, as was also a moderate rise in the Arkansas for a short distance below Pueblo.—*F. H. Brandenburg, District Forecaster.*

SAN FRANCISCO FORECAST DISTRICT.

The season continues abnormal. There appears to have been a permanent depression over the southwestern portion of the country. The Pacific "high" may be inferred to have either swung somewhat westward or lost energy. The season has been cool and it is reported by masters of transpacific steamers that not for ten or more years has it been so cool on the Pacific.

No rain has fallen in California. A few thunderstorms in the mountains were reported. The locus of unsettled weather was in northeastern Nevada, southern Idaho, and northern Utah.

No storm warnings were issued during the month.—*A. G. McAdie, Professor and District Forecaster.*

PORTLAND, OREG., FORECAST DISTRICT.

The month was showery and cooler than usual. No special warnings were issued or needed, except for a slight rise in the Columbia River, due to melting snow in the mountains. Ordinarily the Columbia River is in flood during the months of May and June, but this year the rise was so small as to cause but little inconvenience. The highest stage at Portland occurred June 16, and it was only 13.6 feet, which is the lowest spring high water that has occurred during the last 26 years, with the exception of the year 1889, when the highest stage reached was ten feet.

The public was advised early in April that the winter snowfall in the mountains within the drainage area of the Columbia River was the smallest in many years, and consequently the low stages that followed were anticipated.

Mr. A. B. Wollaber made the forecasts from June 1 to June 17, inclusive, and the undersigned during the remainder of the month.—*Edw. A. Beals, District Forecaster.*

RIVERS AND FLOODS.

The reputation of June as a month of floods was well sustained during the present month. There was a short but very destructive flood in the upper Mississippi and its tributaries during the first half of the month, which, however, did not extend below the mouth of the Illinois River; another great flood in the Grand River of Michigan, almost as extensive as the overflow of the previous year; continued floods in the Rocky Mountain States, doing still more damage to railroads, bridges, and farms; a moderate but greatly prolonged flood in the Red and Ouachita rivers, some close approaches to the danger lines in the lower Arkansas, and some local floods in the interior of New York. The Mississippi River flood, and also that in the lower Des Moines River, began on the 10th from La Crosse to Hannibal, and were due to the heavy downpour of rain on the 9th and 10th. At Leclaire, Iowa, the rainfall for 24 hours was 4.41 inches; at Davenport, Iowa, 4.59 inches; at Burlington, Iowa, 6.04 inches; at Keokuk, Iowa, 4.68 inches, and at Warsaw, Ill., 4.00 inches. In the lower Des Moines Valley the rainfall was torrential, 10.09 inches having fallen in 12 hours at Keosauqua, Iowa.; 10.63 inches in 12 hours at Stockport, Iowa, and 12.10 inches in 12 hours at Bonaparte, Iowa. There could be but one result from such a torrent of water. The lower Des Moines Valley at once became an inland sea. The rain and rising waters came so suddenly that no special warnings were practicable. At Keosauqua, Iowa, the river rose 16.3 feet in seven hours to a stage of 20.2 feet, and finally reached 23.5 feet during the afternoon of the 10th. This stage was 0.2 foot higher than the high-water mark of 1851, 1 foot higher than that of 1897, and 4 feet below that of 1903, the highest stage of record.

The torrent from the Des Moines River speedily passed into the Mississippi and at Keokuk, Iowa, the combined effect of the upper Mississippi, the Cedar, Iowa, Skunk, and Des Moines rivers caused a rise of 8.4 feet to a stage of 18.4 feet during the 19 hours ending at 2 p. m. June 10. At Warsaw, Ill., at the mouth of the Des Moines River, the rise was 8.2 feet in 28 hours to a maximum of 21.3 feet, 3.3 feet above the danger line.

It is impossible to give an accurate estimate of the damage caused by these floods. Farms and railroads were the greatest sufferers, and the losses from various causes must have amounted to millions of dollars. Estimates varying from $5,000,000 to $15,000,000 have been received. Very fortunately the loss of life was small, only two fatalities having been reported.

The following report on the flood in the Keokuk, Iowa, district was made by Mr. F. Z. Gosewisch, Official in Charge of the U. S. Weather Bureau office, Keokuk, Iowa:

On Friday, June 9, the river was falling at the rate of 0.2 to 0.3 foot a day, with every indication that this rate of fall would continue for several days. At 5 p. m. the stage was 10.0 feet, with the river still falling.

During the afternoon light showers fell, but at 8.30 p. m. heavy thunderstorms began, and by 9.15 a. m. of the 10th, 4.62 inches of rain had fallen, with a total of 4.80 inches for the 24 hours.

The river began to rise rapidly at midnight, rose four feet by 7 a. m. of the 10th, and reached the highest stage, 18.4 feet, by 2 p. m., a rise of 8.4 feet in fourteen hours.

It was apparent from the rapidity with which the river rose that the flood was due entirely to excessive rains within the immediate vicinity of the Mississippi and Des Moines rivers.

From Nashville, Iowa, seven miles north of Keokuk, it was reported that a square box, freely exposed on the bow of a boat, received twelve inches of water, and at Hamilton, Ill., opposite Keokuk, a mortar box is said to have received ten inches of rainfall.

The rise was so sudden and unexpected that there was no opportunity for sending telegraphic warnings. In fact, on the morning of the 10th telegraphic service was so badly interrupted that the first reports were not received until 12.30 p. m.

The Weather Bureau office at Hannibal was given the morning report